CHAPTER IV: IMPROVEMENT OF THE FALLS OF THE OHIO, 1783-1860

The Corps of Engineers launched its program for the improvement of navigation on the Ohio River in 1824, but for several reasons, chiefly political, Congress did not authorize a federal project for the improvement of the Falls of the Ohio, the worst obstruction to navigation on the river, and that project was undertaken by a private corporation. The hydrographic studies of Thomas Hutchins in 1766 publicized the nature of the obstructions at the Falls and indicated that improvements to navigation were feasible. It will be recalled that Thomas Jefferson, after study of the Hutchins map, speculated on possible improvement methods at the Falls as early as 1781.

During the late eighteenth century, as an extensive flat and keelboat traffic developed on the Ohio, several methods of improving the Falls were suggested; and after 1800 several private companies, chartered by state legislatures, funded engineering studies of the Falls and made abortive attempts at improving navigation. When the immense development of steamboat commerce began after the War of 1812 the improvement of navigation at the Falls became imperative, and, in the face of federal inaction, the Commonwealth of Kentucky chartered the Louisville and Portland Canal Company in 1825. With the aid of state and federal funds, this company completed the construction of a canal around the Falls of the Ohio in 1830. By the time the canal was completed the federal government had become a major stockholder in the corporation, but despite repeated urging by river interests, who wished the removal of excessive tolls, Congress refused to purchase the remainder of the stock and convert the canal to a toll-free federal project. The corporation eventually, as authorized by the Kentucky legislature in 1842, used its profits to purchase privately owned stock and delivered it to the federal government. By 1855, except for five shares held by the directors of the corporation, the United States was the sole owner of the canal, but Congress chose to leave the control and management of the canal to the directors; and the Louisville and Portland Canal Company became one of the first, if not the first, public corporation in the United States, a forerunner of the modern Tennessee Valley Authority and United States Postal Service.[1]

Congress authorized the improvement of the Louisville and Portland Canal after the Civil War, and the Louisville and Portland Canal project became the responsibility of the Corps of Engineers. The officer assigned to the project was permanently stationed at Louisville, and thereby became the first District Engineer of the modern Louisville Engineer District. A review of the history of the Louisville and Portland Canal prior to the formation of the Louisville Engineer District is therefore in order.

Falls of the Ohio: Problems of Navigation

English explorers and British Army Engineers wrote relatively accurate descriptions of the Falls of the Ohio long before the region was settled — those written by John Peter Salley in 1742 and Captain Harry Gordon in 1766 will be recalled — and practically every traveler on the Ohio who kept a journal recorded his impressions of the worst navigation obstruction on the river. The Falls were formed by an irregular mass of limestone underlying the entire width of the river for a distance of about two miles, forming, in effect, a

natural dam. The river was wide and relatively deep above the Falls, while below it was about half as wide with a lesser navigable depth for about fifty miles. The name "Falls" was a source of some confusion to early navigators, who often expected to find a precipitous cataract, whereas the Falls of the Ohio were not even visible at flood stages. The contraction of the river below the Falls caused the lower pool to rise more than twice as fast during floods than the pool above the Falls, until, at the highest stages, the gradient of the slope was so reduced as to permit navigation with relative ease. But such high stages ordinarily occurred during less than two months of any single year, and for the remainder of each year the whitewater rapids of the Falls made navigation exceedingly hazardous.[2]

Early descriptions of the Falls of the Ohio reported the gradient at the Falls at low water at from twenty-two to twenty-eight feet. (In 1914, it was officially reported as 25.24 feet.)[3] There were three channels, or chutes (also "shoots"), over the Falls known as, proceeding from the Indiana to the Kentucky bank, the Indiana (also Indian) Chute, the Middle Chute, and the Kentucky Chute. As the river rose, the Indiana Chute first became navigable, followed by the Middle Chute, and finally the Kentucky Chute. Two projecting rocks in the Indiana Chute, about fifteen feet apart, practically standardized descending flatboat traffic at a width of fourteen feet.[4]

At low-water seasons, teamsters and the drayage industry between Louisville and Shippingport flourished, while waterborne commerce languished. Not long after Louisville was founded in 1778, porfessional Falls pilots who guided waterways traffic over the Falls were in business. Before the Civil War the Falls pilots, on occasion aided by the Corps of Engineers, took advantage of extreme low water to clear especially hazardous rocks from the Falls chutes. With the possible exception of some snag removal accomplished by the firm of Tarascon and Berthold in 1818 in the harbor at Shippingport, this was the first improvement of navigation over the Falls. Support of the Falls pilots and other navigation interests for improving navigation over the Falls eventually led to Congressional authorization of a federal project for that purpose in 1874, but most early efforts to improve navigation at the Falls were devoted to the construction of a canal, or canals, bypassing the obstructions.[5]

Early Canal Projects, 1783-1812

Perhaps the first proponent of a canal around the Falls to actually attempt to initiate a project was Christopher Colles, an eminent Irish-American civil engineer. Colles, a notable advocate of the construction of the Erie Canal in New York state, like George Washington and Thomas Jefferson, studied the maps of the Ohio River and the Falls prepared by Thomas Hutchins, and he came to the conclusion that the best method of improving the Falls would be by the construction of a canal. On July 4, 1783, he petitioned Congress for a land grant at the Falls, proposing to form a company to construct and operate a canal and thereby open an all-water route for settlers bound for the West. But his petition was not granted.[6]

All states and, in the earliest days, territories (Ohio achieved statehood in 1803; Indiana in 1816) bordering the Ohio River above the Falls became interested in canal projects at the Falls to varying extents; and several canal companies which proposed to accomplish the feat were chartered by state and territorial legislatures in the early nineteenth century. The

state of Ohio was especially active, supporting projects sponsored by both the Commonwealth of Kentucky and the Territory of Indiana. But therein lay the principal complication which early canal companies met, for the states could not agree on the canal location.

The Territory of Indiana incorporated the Indiana Canal Company in 1805; it had some distinguished directors, including General George Rogers Clark, Congressman Jonathan Dayton, General Benjamin Hovey, former Vice President Aaron Burr, and others. General James Wilkinson, who had launched commercial trade with New Orleans via the waterways in 1787 and who had suffered heavy losses at the Falls of the Ohio, lent his support to the Indiana Canal Company. He claimed the project, in addition to its benefits to navigation, could provide valuable water power for industry. He declared that the premience of the Falls of the Ohio area could not "in point of locality and fitness for the grand emporium of internal commerce, be controverted; its position at the head of easy navigation, and its central relation to the most extensive, luxuriant and productive tract within the national limits, or perhaps in the universe, will, at the first glance, decide, that commercial enterprize is to find its way to this point from the ocean, and that here the primary exchange of products for imports is to take place."[7]

The company petitioned President Jefferson and Congress for federal aid for the project, asking a grant of twenty-five thousand acres of public lands to sell and thereby fund the project. Whether this company actually intended to construct a canal, or whether there were other motives behind its organization was questioned. Some suspected that its real purpose was to form an unauthorized banking business; and the participation of General Wilkinson and Aaron Burr in the enterprise later led to speculation that it was organized as a cover for the Burr Conspiracy of 1806. Whatever the motives, Congress refused to authorize the use of public lands for the stated purposes.[8]

Louisvillians, led by James Berthold of the firm of Tarascon and Berthold, organized a state-chartered company, the Ohio Canal Company, in 1804 and employed a former officer of the Corps of Engineers to study and map the Falls and prove the advantages of the canal site on the Kentucky bank. Jared Brooks, who had served as a Lieutenant in the First Regiment of Artillerists and Engineers, conducted extensive studies of the hydrology of the Falls of the Ohio in 1805, made a detailed survey of the area, sank shafts to investigate the character of the subsoil and rock strata, and prepared a map which clearly proved the best canal route lay along the Kentucky shore. Brooks laid out the route which was eventually followed by the Louisville and Portland Canal. The Kentucky legislature forwarded the report of Brooks to Congress along with a request for federal aid; and in 1806 a committee of the House reported that on the basis of Brooks' studies it would recommend federal aid for the canal project if the revenue of the United States had not been "already pledged" for other purposes.[9]

At the request of Henry Clay and other congressmen from the Ohio Valley, further study of the canal projects at the Falls was authorized as part of the comprehensive study of American transportation problems conducted under the direction of Secretary of Treasury Albert Gallatin in 1807. Jared Brooks provided the Secretary with maps of the Falls area and a lengthy report on the subject. According to Brooks, the "dormant wealth of this im-

portant section of the national domain can be brought into life and action only by a free and open navigation, and the assistance of water-works for the encouragement of manufactures." The canal at Louisville, he contended, would meet those two overriding needs. Secretary Gallatin was impressed by these arguments and by the fact that sea-going ships were regularly descending the Ohio at that time, and he recommended in his report of 1808 to Congress that three hundred thousand dollars in federal funds be apropriated to construct the canal project; but no action was taken on this, or on his other recommendations.[10]

Indiana Falls Canal Projects

After the War of 1812, the growth of steamboat commerce and the increasing economic development of the Ohio Valley led to renewed efforts to bypass the Falls with a canal. One of the first laws enacted by the first state legislature of Indiana in 1816 incorporated the Ohio Canal Company, but the company did not take advantage of its charter and in 1818 the state chartered a third Falls canal company. The Jeffersonville Ohio Canal Company, financed largely by Cincinnati capital, actually initiated canal excavation on the Indiana bank, but the clays of Clark County, Indiana, proved to be more durable than the funds available to the company. Studies of possible canal sites on the Indiana bank of the Falls of the Ohio continued until well after the Civil War, usually inspired by public displeasure with the limited size and high tolls of the canal completed on the Kentucky bank, but no such project was ever completed.[11]

Creation of Louisville and Portland Canal Company

Near the end of the War of 1812, Laommi Baldwin, a distinguished American civil engineer prepared plans for a canal for keelboats along the Kentucky bank, but the Kentucky canal company could not find the financial support necessary to initiate construction. The canal projects at the Falls were caught up in the economic rivalry between the Queen City, Cincinnati, and the Falls City, Louisville. A Cincinnati newspaper editor accused Louisville in 1818 of covert opposition to a canal, or at best support for the construction of an "inefficient" keelboat canal. He wrote: "the moment a canal is constructed sufficient to convey boats up and down the falls, that moment Louisville *sinks* to a level with other towns on the river. . . ." The editor of the Louisville *Public Advertiser* responded that Louisvillians were "really anxious" for construction of the canal, and accused Cincinnatians of supporting canal projects on the Indiana bank of the Falls because such a canal would be a blow to Louisville.[12]

There were some, chiefly those in the business of transporting freight around the Falls, who were opposed to canal projects in 1818, but support for the project was building. Henry McMurtrie, the Louisville historian, argued in 1819 that the construction of a canal around the Falls, that "formidable and intimidating spot, whose terrors have paralized the arm of enterprize," would be a boon to the commerce of Louisville and the entire Ohio Valley. He declared the canal was vital to the security of New Orleans and the Gulf Coast and suggested that the United States should establish a military depot at the Falls where the "munitions of war" might be speedily dispatched down the waterways by steamboat. McMurtrie urged the aid of the federal government in the canal project, and declared that the project would never be constructed with-

out aid from the United States, "whose aid and countenance in this undertaking every inhabitant of this section of the Union sincerely prays for."[13]

When the Commission representing Ohio Valley states reached the Falls of the Ohio at the end of the survey of the Upper Ohio in 1819, as directed by participating states, the members examined the Falls of the Ohio to compare the proposed Kentucky and Indiana canal projects. They collected previous engineering reports, resurveyed the Falls, and recommended the construction of a canal on the Kentucky side. They estimated the costs of the Kentucky canal at less than $400,000, while the Indiana canal might cost as much as $1,000,000. The Army Engineers, commanded by General Simon Bernard, who continued the survey of the Ohio in 1821, began their work with an examination of the Falls area and proposed canal routes. Because Congress had not directed it, they did not report their opinion of which might be the most desirable canal route, but their figures substantiated the previous reports of Jared Brooks and the Joint Commission of 1819.[14]

In 1823 the state of Ohio directed Judge David S. Bates, who had acquired his engineering expertise and experience on the Erie Canal project in New York state, and Alfred Kelly, an Ohio state canal commissioner, to reexamine the Falls. The two engineers reported the canal route on the Kentucky bank was most feasible and least expensive, commented that the "business of the country above the Falls annually, pays a tax to this rock of greater amount than it would cost to make the improvement," and estimated that benefits of the project would consist of savings of $150,000 in transportation costs annually. The report of the Ohio engineers, along with an offer from the state of Ohio to join Kentucky in funding a project, was presented to the Kentucky legislature in 1824. An extended debate ensued in the Kentucky legislature over whether the state should construct the project, or whether a state-chartered private corporation should be given that privilege. The controversy was settled in favor of the proponants of construction by a corporation; and a bill establishing the Louisville and Portland Canal Company was signed by the Governor of Kentucky on January 12, 1825.[15]

Initial Construction

Citizens of several states purchased stock in the new canal company, but private capital came principally from Philadelphians, who hoped to use a canal over the mountains to Pittsburgh and the Ohio River as a trade route to the West, competing with the Erie Canal in New York state which was completed in 1825. The Louisville and Portland Canal Company selected Judge David S. Bates as chief engineer of the project. He served concurrently as chief engineer for the canal system under construction in Ohio, and his son, John Bates, and Alfred Barrett, another former Erie Canal engineer, had immediate supervision of the Louisville project.[16]

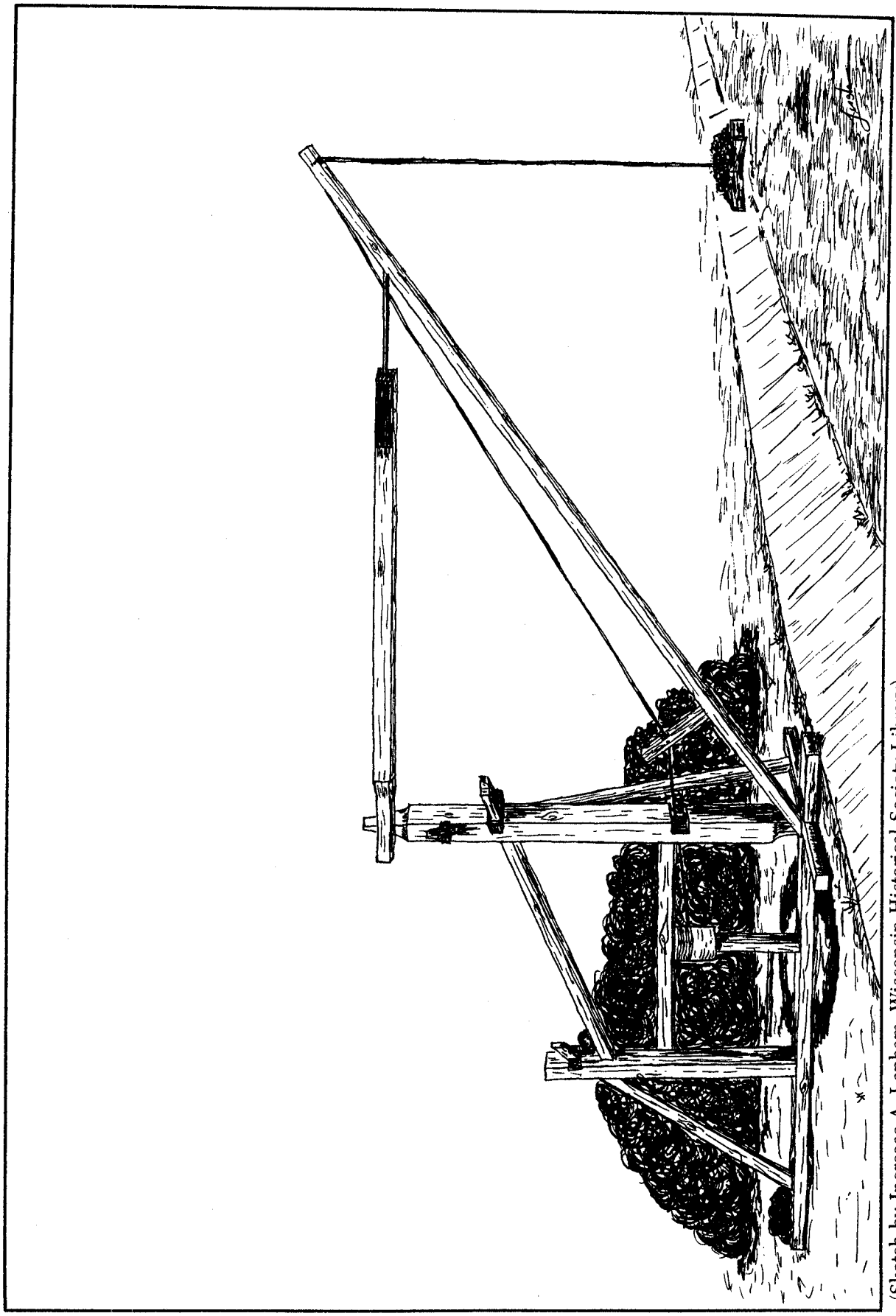
Judge Bates' plans called for a canal about two miles long from the harbor before Louisville through the Portland section to rejoin the river below Shippingport. He estimated that 112,000 cubic yards of rock and 633,358 cubic yards of earth would be excavated from the canal and lockpits. Three lift-locks, each to be 190 feet long, 50 feet wide, with a lift of eight feet, eight inches, were located at the lower end of the canal. A massive guard lock was to be constructed at the head of the lift-locks to protect them from

drift and silt during high water periods. Judge Bates estimated the locks would require the placement of some 30,000 perches (about 25 cubic feet per perch) of stone masonry. But the estimates were quite rough, specifications were not firm, and detailed plans were not in existence. It was the custom of pioneer canal engineers to prepare only general plans and work out the details as the project progressed; planning was flexible, usually on an empirical basis, and extensive modifications to the Louisville canal project were effected during the course of construction.[17]

The canal company advertised for bids from contractors on October 22, 1825, stating their intention to have the work completed in the "shortest possible time" and requesting that sealed bids be submitted by December 22, 1825. About twenty-five bids were received from contracting firms of several states; and in late December the contract was awarded to the lowest bidder, Chapman, Culver, Lathrop, Collins, Perrine, & Company, formerly contractors on the Erie Canal. Their bid was for about $370,000, nearly twenty percent less than the estimated costs, with completion scheduled for November 1, 1827. It appears the work was somewhat larger than the contractors could handle independently, for they subcontracted portions of the excavation to the firm of Southerland and Adams and lock construction to the Carney and Sayre Company. The first work began on March 1, 1826, but construction was held up for a month by continued high water. Only about 35 men and their teams were employed in grubbing and clearing the line of the canal during the first few months of construction, and considerable difficulty was met in employing laborers during the summer of 1826 because of a smallpox epidemic in the vicinity of the project. But by the end of the summer some 1000 hands were at work; and lock construction was initiated in September. To supervise construction of the locks, Judge Bates employed John R. Henry and young Increase A. Lapham, who had previously been employed on the Erie Canal in the design and construction of the elaborate five-flight lock structure at Lockport, New York. When John Bates and Alfred Barrett left the project, John R. Henry became resident engineer, with Lapham as his assistant.[18]

Excavation Methods

The techniques utilized for construction of the Louisville and Portland Canal in the late 1820s did not materially differ from those used on the Egyptian pyramids and Roman aqueducts milleniums before. The contractors at the canal, like the Ancient builders, relied on human and animal power. Excavation was accomplished with hand tools, oxen-drawn plows, and scrapers dragged by horses; and the excavated materials were removed by wheelbarrows and horse-drawn carts. The principle advance in excavation techniques between Roman times and the nineteenth century was the use of gunpowder for rock excavation. In the lockpits and canal cross-section, holes were drilled into the rock by men using sledgehammers and hand drills, the holes stuffed with black gunpowder, and clay tamped in atop the powder, leaving small apertures for priming powder and a fuse, which was ordinarily a twist of paper soaked in saltpetre. Holding a drill while men pounded it with sledgehammers and blasting rock with black powder was a dangerous business and accidents were frequent. The laborers employed on the project were a rough crew of Irishmen, many of whom came to the work from other canal projects, and a



(Sketch by Increase A. Lapham, Wisconsin Historical Society Library)
DIBBLE CRANE FOR RAISING MATERIALS FROM EXCAVATION AT LOUISVILLE AND PORTLAND CANAL, 1827

(Engraving from Charles B. Stuart, *Lives and Works of Civil and Military Engineers of America*, 1871)

CANVASS WHITE, 1790-1834

"Genius of the Erie Canal" — patented hydraulic cement in the United States. Consulting engineer on the Louisville and Portland Canal.

large member of slaves hired from their masters. It has been claimed that, because of their rough character, the sobriquet "Hoosier" was first applied to the workmen at the Louisville canal.[19]

Mechanization

Several efforts were made to mechanize construction methods, chiefly to facilitate removal of the excavated materials after the depth and side slopes of the canal were too great for easy handling. A stiff-legged timber crane, supposedly invented by Mr. Orange Dibble on the Erie Canal, was put into use in raising loads of material from the bottom of the excavation. Another device, invented by Mr. Oliver Phelps on the Welland Canal, was also put into use. It consisted of a windlass at the top of a timber railway running up the canal slope. A horse-drawn train of loaded carts at the bottom of the slope had a rope attached to its front; the rope ran up the slope, around the windlass, and was attached to the back of an empty cart train, also pulled by horses, going down the slope. The weight of the empty cars and the power of the teams pulling them was thus added to the power of the teams pulling the loaded carts up the slope.[20]

Lock Construction

The walls of the locks and canal were constructed of cut stone masonry, on the same principles developed by the Ancient builders. Stone for the project was quarried a few miles below the site and transported up river. In 1827 the canal company employed Canvass White, who had won the sobriquet 'Genius of the Erie Canal," as consulting engineer. White had studied canal and lock construction in Europe on behalf of the New York project, and during the construction of the Erie Canal had discovered "waterproof lime," actually the first hydraulic cement in America. He conducted experiments with various limestones and found a variety which, when burned, pulverized, and mixed with sand, formed a mortar which hardened in water. White found that the limestone excavated from lockpits at the Louisville canal would serve the same purpose. A steam mill was constructed to grind the stone to powder, for use in binding the masonry in the lock walls together — it was reported this grout soon became harder than the stone used in the construction. By 1874 eight hydraulic cement factories, with an annual production valued at a million dollars, were in business at Louisville.[21]

The total amount of masonry placed in the lock and canal walls and in the stone bridge over the canal was approximately 41,989 perches, equal to the amount used in thirty ordinary canal locks of the era. The guard lock and three lift-locks all had solid rock foundations. As completed, the guard lock was 190 feet long, 52 feet wide, and 42 feet high, containing 21,775 perches of masonry. The three lift-locks were the same width as the guard lock, 20 feet high, and 183 feet long, with a lift of eight feet, eight inches each. The length of the walls, from the head of the guard lock to the end of the outlet lock was 921 feet. Two bridges, one of stone and the other of wood, spanned the canal. The stone bridge, which had three arches, was 240 feet long and contained 5,741 perches of masonry, was erected by Carney and Sayre Company for $20,000. The wooden draw bridge, completed by a contractor named Tanner for $850, accommodated traffic between Portland and Shippingport. Built over the head of the guard lock in a position similar to that of the metal draw bridge at McAlpine Locks in 1975, it was in two parts (Bascule) and was raised

and lowered by chains running through windlasses, with boxes filled with stone, old grate bars, and other heavy materials as counterbalances.[22]

Contractor Failures and Federal Participation

Many citizens who pledged to purchase stock defaulted at the commencement of construction in 1826, but the project was saved by an appropriation of Congress for purchasing the forfeited stock. The United States became a major stockholder in the corporation, but it appears the federal government made no effort to influence company policies or aid construction in any other manner. When the original contractors failed in 1828, apparently because of the high costs of excavation and the necessity of paying high wages to attract workers, which considerably exceeded contract estimates, Congress again saved the project by purchasing the rest of the forfeited stock. The company renewed work, serving as its own general contractor and reducing costs by modifying a number of project features.

The width of the walls of the lift-locks was reduced and buttresses on the back side of the walls were eliminated. Rock excavation ceased and many projecting rocks were left to plague navigators at a later date. John R. Henry was retained as project engineer for the directors; Increase A. Lapham continued as assistant engineer; and a number of former subcontractors were hired as overseers. Seven new contracts were let for various unfinished sections of the project; and in the working season of 1830 the canal was completed.[23]

First Boats Through and Final Costs

On the first of December, 1830, water rose nearly to the top of the cofferdam at the head of the canal, and the dam was removed to permit filling of the canal. Flatboats passed through the canal in early December, and on December 21 the first steamboat, the *Uncas*, Captain Beer, with full cargo bound for Nashville, locked through. One of the first vessels to use the canal was a flatboat from Cleveland, Ohio, which had navigated the Ohio state canal system and the Muskingum River to Marietta and proceeded down the Ohio on its way to New Orleans.

Although the directors of the Louisville and Portland Canal Company listed construction costs at $742,869.94, actual costs, including interest on funds borrowed to complete the project, were $1,019,277.09. Captain Thomas Cram, Corps of Engineers, who investigated the project at the order of Congress in 1844, concluded that, though actual costs were nearly three times the original estimates:

> Considering the numerous difficulties experienced by the company in the outset, and during the progress of their undertaking, the want of confidence in the success of the work, evinced by the fact that almost all the subscribers living in its vicinity forfeited their stock after having paid installments thereon, it may be said on the whole that the cost of the Louisville and Portland canal was reasonable.[24]

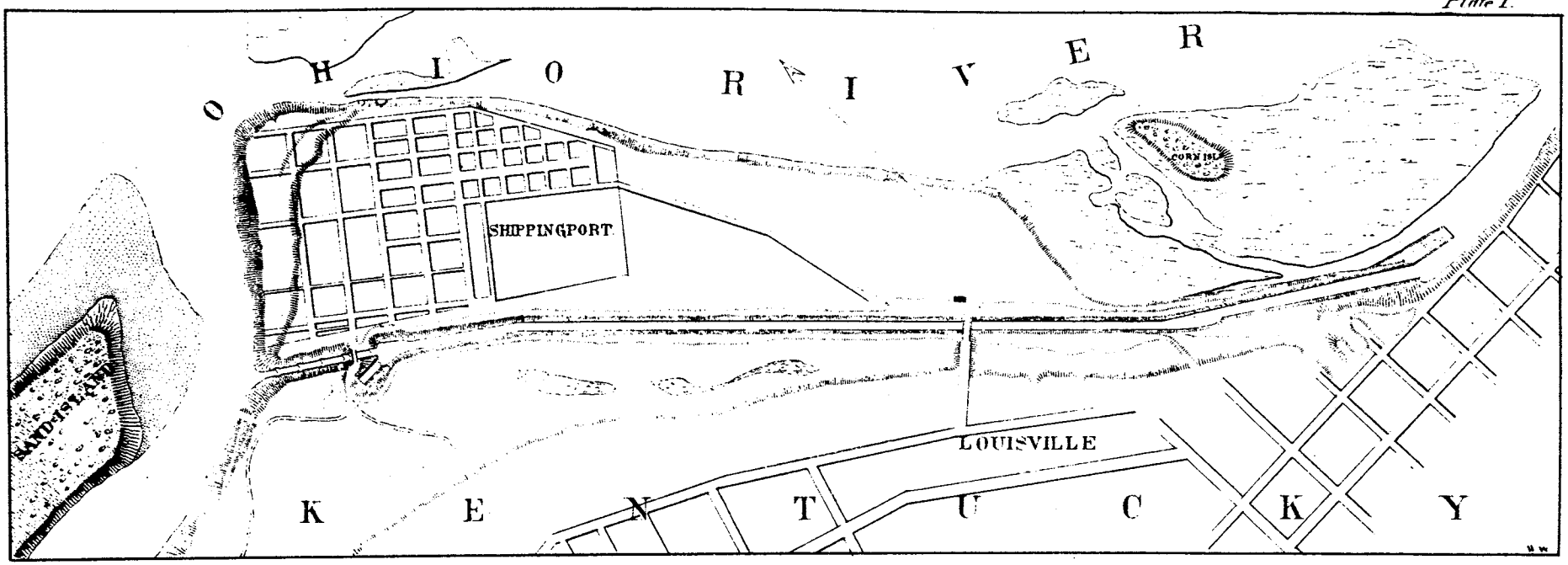
Canal Operation

During the first 104 days of operation, 827 boats, 406 of them steamboats, locked through. The editor of *Niles' Weekly Register*, a journal with national circulation, commented: "And yet this noble and beneficent undertaking was thought by the advisers of the executive, to be too contracted and diminutive a concern to deserve the aid of the general government. If such works as these be not national, what shall we call so."[25]

Numerous problems which delayed navigation were experienced in operation

CONDITION
OF THE
LOUISVILLE AND PORTLAND CANAL.
BEFORE ENLARGEMENT

Scale



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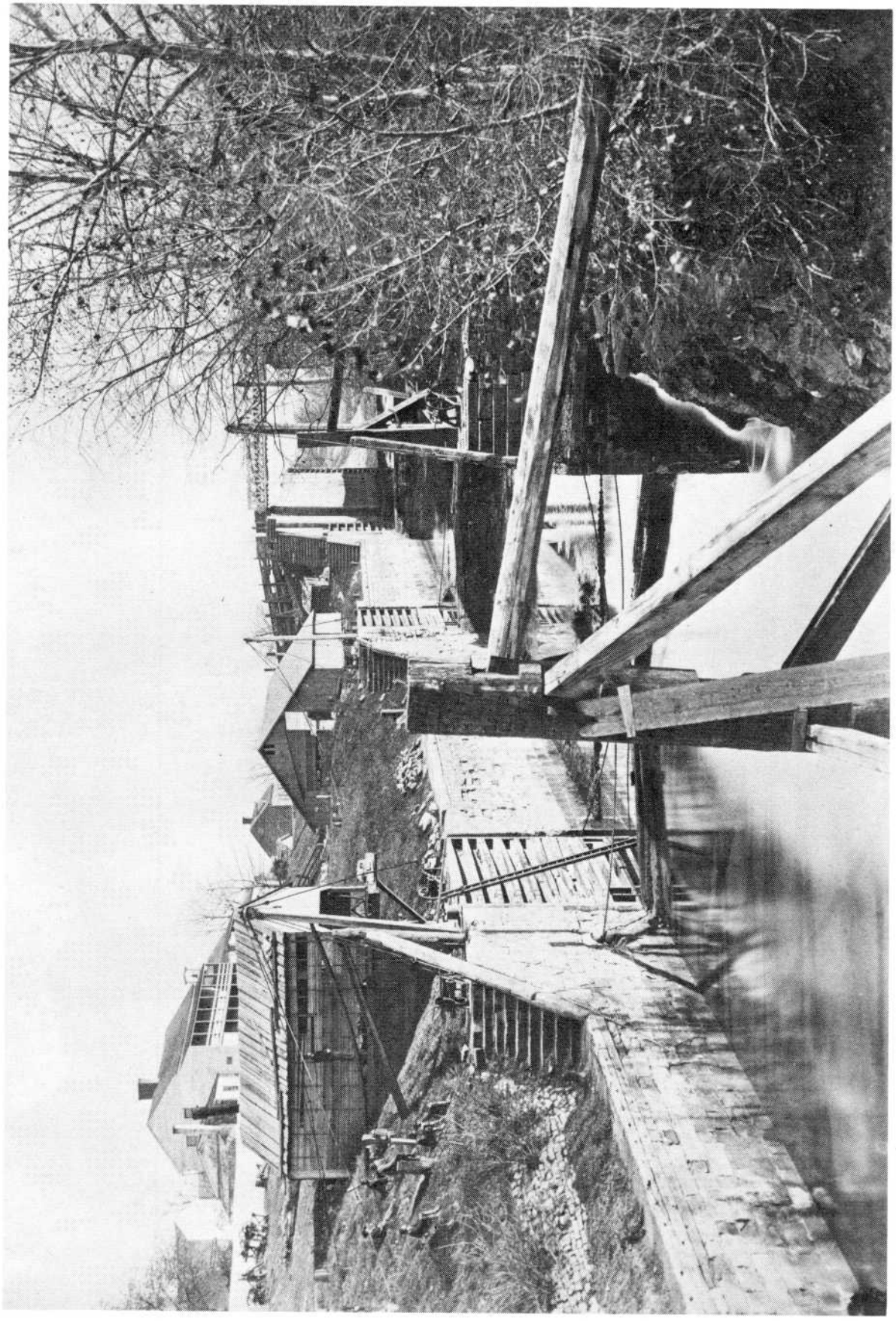

Louisville and Portland Canal — Three flight locks completed by the Louisville and Portland Canal Company in 1830. Photo probably taken in 1874.

(Record Group 77, Natinal Archives)

of the project. Extensive deposits of mud and debris were left in the locks and canal after each flood. The flood of 1832, which left a number of wrecked houses in the canal, required extensive repairs and alterations to the project. In 1833 a steam-powered dredge, of the "endless-chain-of-buckets" or ladder type, was built to remove mud and silt. Later dredges were the dipper type. The wooden lock-gates were opened by chains attached to manually operated capstans mounted on the esplanades. Lockmen turned the capstans, winding the chains around drums, to maneuver the gates. It was a slow process requiring an hour and a half to pass a single boat through the series of locks; delays as long as five hours in passing the canal and locks were frequent.[26]

The number of vessels using the canal still increased; more than a thousand vessels locked through in 1835, and an average of 1300 passed through every year thereafter until the onset of the Civil War. Tolls collected from this commerce made the canal a profitable enterprise from the first, and stockholders averaged a return of eight percent annually on their capital. The Governor of Kentucky lamented:

> It must be a subject of perpetual regret to every patriotic mind that the state did not, with her own resources, undertake the construction of the canal at Louisville. It would have been an imperishable fund — a source of revenue as lasting as the Ohio River itself — which would have enabled the government to accomplish the most extensive and useful plans without increasing the burdens of the people.[27]

But there were segments of the population of the Valley who did not appreciate the canal. On January 23, 1833, several kegs of gunpowder were deposited in the locks and detonated. One of the locks was heavily damaged, and the company offered a $5000 reward for the capture of the perpetuators, but the culprits were not found. There were also attempts to blow up the stone bridge; and boats loaded with coal were sunk at the head of the canal. It was suspected the saboteurs were disgruntled draymen whose business had been reduced by the opening of the canal.[28]

Limitations of the Canal

The principal value of the Louisville and Portland Canal was that it permitted shipment of goods from the Upper Ohio Valley without transferring cargoes at the Falls and reduced the delays which often resulted in alternate glutting and famine at the New Orleans and other downriver markets. But this value was limited by certain defects in planning. The stone bridge over the line of the canal had a clearance of sixty-eight feet at low water, and boats with high stacks had to lower them to pass under. The lock chambers, designed for vessels used on the rivers in the 1820s, limited hull dimensions to 183 feet long by 49½ feet beam; and by 1853 over forty percent of the steamboats on the Ohio were too large to pass through the canal. Steamboat designers increased the draft on vessels to enlarge cargo capacity, and steamboats were often seen backing through the canal, or "crabbing through," to thrust available water back under the hull and drag the boat across accumulated silt on the canal bottom. These limitations were often complained of by rivermen, but the principle objection was to the high tolls charged at the canal.[29]

The original toll was twenty cents per ton, but high maintenance and operation costs, chiefly due to the damages resulting from repeated floods, necessitated an increase to forty cents in 1833 and to sixty cents in 1837. These toll increases substantially reduced the savings in transpor-

tation costs for which the citizens of the Ohio Valley had hoped. At Pittsburgh, Cincinnati, St. Louis, and other ports on the inland rivers, navigation and mercantile interests held protest meetings and sent petitions to Congress, contending that collection of tolls at the canal was a burdensome monopoly, that the tolls were an excessive tax on Ohio Valley commerce, and that, because the Ohio River was a national highway, the project should be taken over and operated by the United States.[30]

The directors of the Louisville canal operation never sought to retain control over the project and were always ready to sell out to the United States, for Louisvillians were in accord with residents of other port cities on the subject of the tolls. The Louisville Chamber of Commerce resolved in 1840 that the tolls seriously retarded "commercial operations and the transportation of merchandise." And the president of the canal company wrote in 1844 that the United States should take over the project because:

> It cannot be controverted that this tax [tolls] is paid indirectly by the agricultural products of the west and south, and the manufactured goods of the east, as well as by passengers travelling on the Ohio from all parts of the Union. Were this tax entirely removed, the competition existing among steamboats for freight would soon cause them to consider it an expense to the carrying trade the less; and the result would be a proportionate reduction, to a great degree, on the cost of transportation. This fact, however, only proved the truly national character of this work — every citizen of the Union being more or less interested in the reduction of the toll; and that the saving would not be confined to steamboat owners alone.[31]

Three schools of thought had developed on the subject of the improvement of the Falls of the Ohio by 1840. The majority of those interested in the problem supported national ownership and operation in such a manner as to eliminate or substantially reduce the tolls at the existing canal. A second group supported the Falls pilots in efforts to gain federal aid for a project to improve navigation by open channel over the Falls. And a third group advocated the construction of a second canal along the Indiana bank — in 1836 Indiana chartered the Jeffersonville and New Albany Company, which proposed to construct such a canal to create two-way traffic around the Falls.[32]

The improvement of the open channels at the Falls was most vigorously supported by the Falls pilots who had to navigate them. In the 1830s the pilots expended some of their own funds in closing secondary channels and removing dangerous rocks from the Indiana Chute; and some small federal aid was provided for the work. Lieutenant Jacob A. Dumeste, by order of the Secretary of War, surveyed the channels over the Falls in 1830; and in 1834 Captain Henry M. Shreve, as agent for the Corps of Engineers, reported to Congress on open-river navigation at the Falls. Shreve advocated blasting rock from the Indiana Chute and placing it in dams across little-used channels to increase water volume through Indiana Chute and the Louisville Canal. But this work was left chiefly to the enterprise of the Falls pilots.[33]

Water Power at the Falls

The United States was very much interested in the water power available at the Falls, for after the War of 1812 considerable support for the construction of a national armory on a western river where watercraft could quickly distribute munitions to armies on the frontiers developed. In 1819 President James Monroe expressed his opinion that the Falls area would

be a most suitable location for an armory; and in 1825 the Kentucky legislature ceded, by joint resolution, jurisdiction over lands which might be acquired at the Louisville canal for a national armory to the United States. The hope that a national armory might be located alongside the canal may have given added impetus to the canal project in 1825; at least, an officer of Army Ordnance discussed the subject with the company in that year.

Colonel George Bomford of Ordnance negotiated an agreement with the Louisville and Portland Canal Company for use of the water power made available by the canal. Colonel Bomford estimated that a national armory would require about 200 acres of land and water power sufficient to work twelve pair of five-foot burr millstones for ten to twelve hours per day. The company agreed to furnish the necessary water power for $3600 annually, and the lands of Senator John Rowan along the canal line were available as a site. But no action was taken by Congress because the location of the national armory in the West became a controversial political issue. Citizens and their representatives near practically every water fall on the inland rivers urged that the armory should be constructed at their site, rather than at Louisville.[34]

In 1828 and 1829, Captain John L. Smith, Corps of Engineers, aided by Lieutenant George Whistler, examined potential armory sites throughout the Ohio Valley, and found acceptable locations on the Wabash and Big Blue rivers in Indiana, on the Licking River in Kentucky, and at the Falls of the Ohio. But Congress found itself unable to agree upon a single site, and in 1842 directed that another survey be conducted. General Walker K. Armistead and Colonel Stephen H. Long of the Army Engineers and Surgeon General Thomas Lawson again investigated numerous sites in the Ohio and Mississippi valleys. Because steam-powered machinery had been perfected, it was no longer necessary to locate the armory at a falls where water power was available, and the officers recommended the construction of a national armory at Fort Massac, Illinois, near the mouth of the Ohio, which was more centrally-located to navigation on the Mississippi River system than Louisville. But Congress again found it impossible to come to agreement on the site, and a national armory in the West was not constructed until the exigencies of civil war required it. The water power available at the Falls of the Ohio was thus left for private rather than public development.[35]

Politics and the Canal

Political controversy also prevented the acquisition and operation of the Louisville canal as a toll-free federal project. Though the directors of the canal, the legislature of Kentucky, and navigation interests on the inland waterways continually supported bills in Congress to convert the canal to a national project and remove the burdensome tolls, opposition came from two quarters. Indianians still hoped a canal would be constructed along the Indiana bank of the Falls and they supported federal construction of this canal, rather than federal acquisition of the Louisville canal. And many citizens throughout the United States maintained that federal control and operation of the canal was beyond the constitutional authority of the United States. This opposition successfully blocked every bill in Congress which would have established federal control of the Louisville and Portland Canal. By 1855, however, federal ownership of the canal was almost complete.[36]

During construction of the project, the United States had purchased and acquired 2,092 shares, at a cost of $233,500, in the canal corporation. During the first decade the canal was in operation, the United States was paid $257,778 in dividends on its stock — more than the original purchase price — while private stockholders received more than double that amount in dividends. In 1841, private stockholders proposed to buy themselves out, since Congress would not do so with appropriations, by applying dividends due the United States to purchases of the private stock; and the legislature of Kentucky authorized this procedure on January 21, 1842.[37]

Congress did not dissent, and by 1855 the United States was the owner of 9,995 shares of canal stock; nevertheless, Congress still refused to accept the canal as a government project, and five shares remained in private hands to qualify their holders as directors of the corporation. The Louisville and Portland Canal Company thus became a public corporation, owned by the United States but operated by directors independent of control by Congress. While perhaps politically advantageous, this administrative organization produced the paradox of the collection of a heavy tax on commerce at the Falls of the Ohio while the remainder of the river was under federal improvement with the purpose of reducing transportation costs — a situation which was to continue until 1880. Precise computations have not been made, but it appears the United States collected more in tolls at the Louisville canal prior to 1860 than it expended on the improvement of the entire Ohio River.[38]

Summary

The hydrographic studies of Thomas Hutchins first indicated the feasibility of a canal project to bypass the obstructions at the Falls of the Ohio, and the surveys of Jared Brooks, a former Army Engineer, proved that the shortest and most economical canal route at the Falls lay along the Kentucky bank. Later studies of the Falls conducted by the joint commission appointed by Ohio Valley states in 1819 and by an Army Engineer survey party in 1821 confirmed the findings of Jared Brooks. But, in the face of Congressional refusal to authorize and fund a definite federal project, proponents of canal projects on the Indiana and Kentucky banks of the Falls engaged in an extended political controversy which, in conjunction with limited capital, prevented any substantial improvement of navigation at the Falls of the Ohio until 1825.

The Louisville and Portland Canal Company, a state-chartered, private corporation, completed construction of the massive canal project on the Kentucky bank of the Falls in 1830, but it required federal and state financial support to accomplish the feat. And, in view of the crude construction methods of the era, the canal was an engineering feat of considerable magnitude, equal in scope to much larger projects constructed in the twentieth century with the aid of modern engineering technology and construction methods. The chief problems with the completed project were two: marine engineers on the inland rivers developed vessels much larger than the capacity of the locks of the Louisville canal; and the high tolls at the canal, which in the end were paid by consumers, materially reduced the value of the project to the Ohio Valley.

Political controversy and constitutional issues prevented federal construction and operation of the project and prevented the construction of a national armory to take

advantage of the water power at the site. The United States did not assume complete responsibility for the improvement of the Falls of the Ohio for navigation until 1874; nevertheless, its interest and limited participation in the construction of the pre-Civil War project did make possible the completion of the canal in 1830, and the United States became the principal stockholder in the corporation not long thereafter. The Louisville and Portland Canal project foreshadowed later projects for improving navigation and developing the latent power at the site, formed the foundation on which subsequent projects were based, and eventually led to the formation of the Louisville District, Corps of Engineers, United States Army.